A Modern Approach To Estimating Ungulate Carrying Capacity

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What is an ungulate anyway?

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- Hooved critters…
- Ungulates we are concerned about for this talk are herbivores and are **ruminants** (4 chambers of stomach)
- Like cattle, elk, deer, sheep, wild and domestic sheep etc.

Carrying Capacity?

- Not really carrying capacity:
- What I mean by this in this talk is:
  - "How much forage is available for ungulates in a given area"?
  - Not worried about **predators**, **disease**, **politics** etc… just capacity of land

Who cares?

- A large part of public policy and administration
  - Wild Horse and Burro Act 1971
  - Public Rangelands Improvement Act
  - Taylor Grazing Act 1934, etc…
- Managers keep close watch on these things
- Don’t want to create unhealthy rangeland situations
- It’s a big part of Allotment Management Plans and the like…

Who cares?

- It's a real juggling act
- So many things to consider…
  - Wildlife use?
  - Rest or recovery?
  - Wildfire concerns….what happens after fire?

Our Approach

- Stems from older but familiar work:
  - Holecheck 1988
- What are the basic elements of a capacity model for ungulates?
  - Vegetation type
    - Phenology
    - Palatability & structure
    - Regrowth potential
  - Annual production
  - Slope
  - Distance from water
  - Others not addressed here

Our Approach

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Our Approach: Palatability

Creosote bush??

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Creosote bush??

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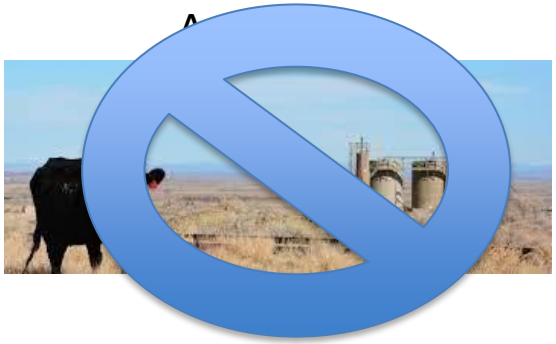
Rabbit brush?

Our Approach: Palatability

Catclaw acacia?

Mountain mahogany?

Criollo



Our Approach: Palatability

Curly mesquite / Aristida spp.?

Angus

Criollo

Our Approach: Vegetation Structure

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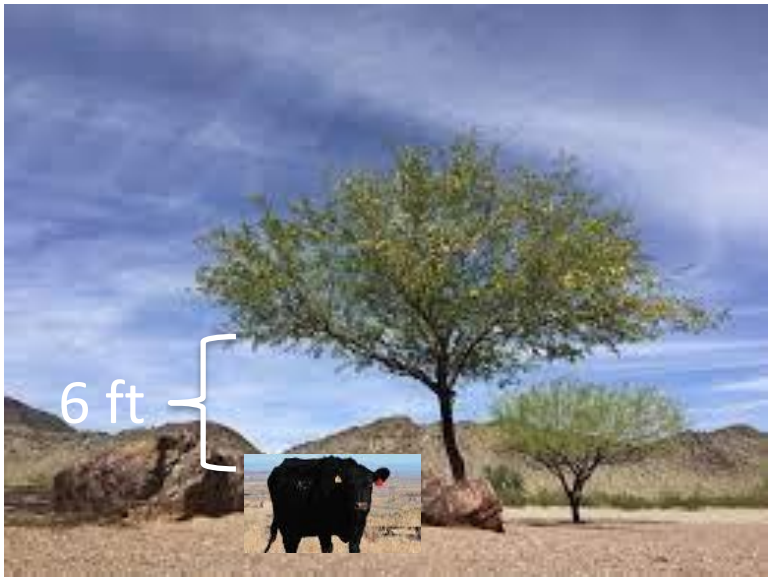

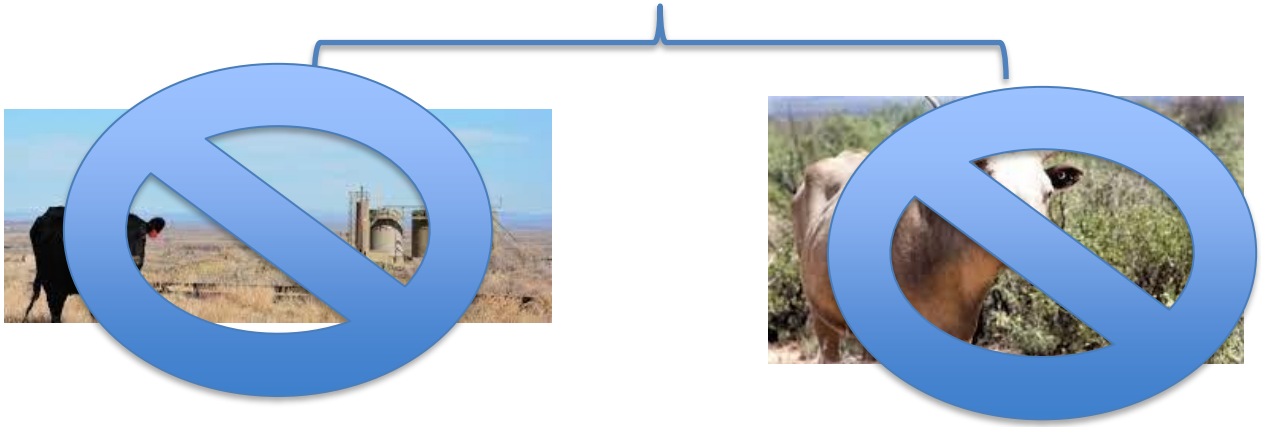

Our Approach: Vegetation Structure

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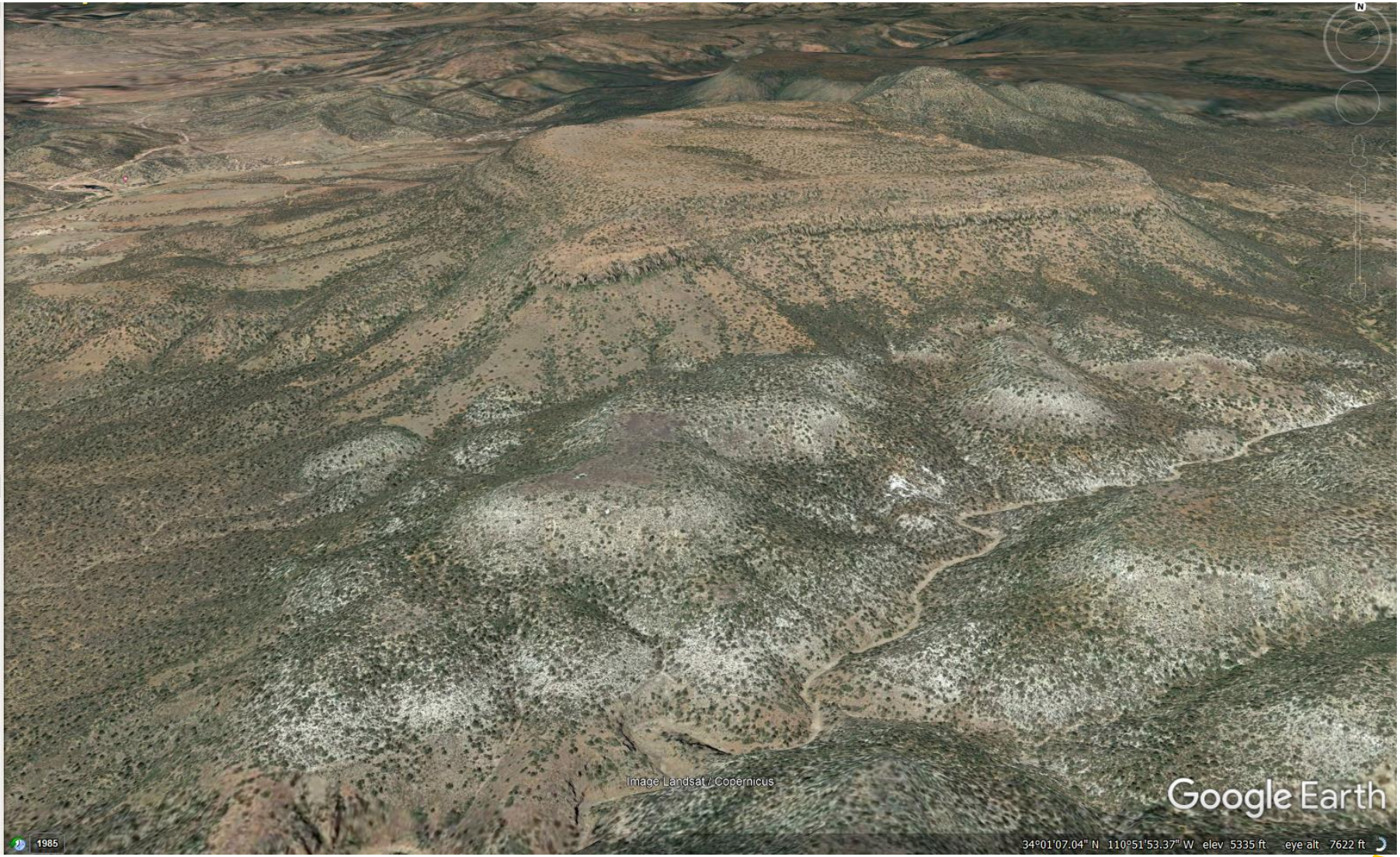
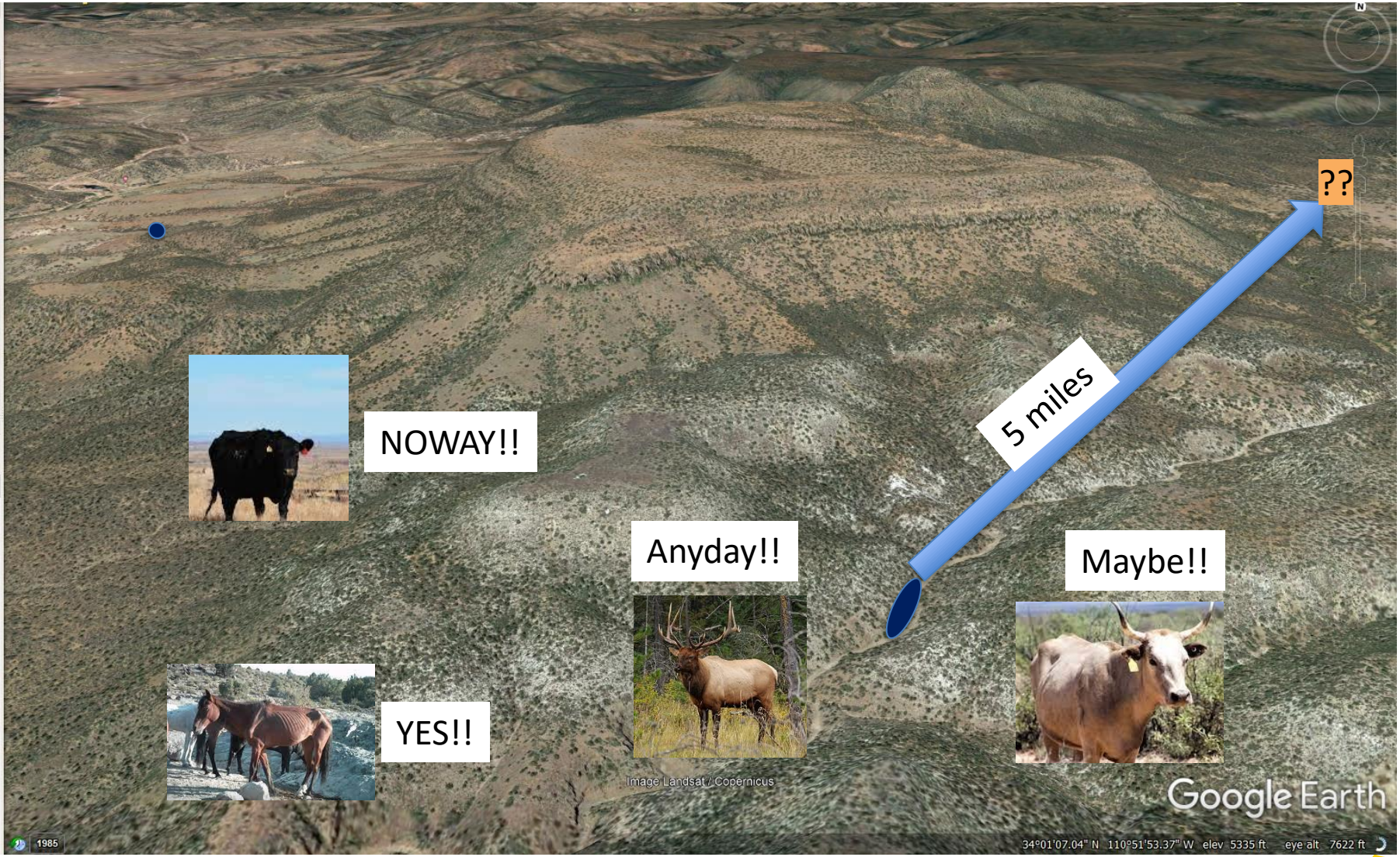
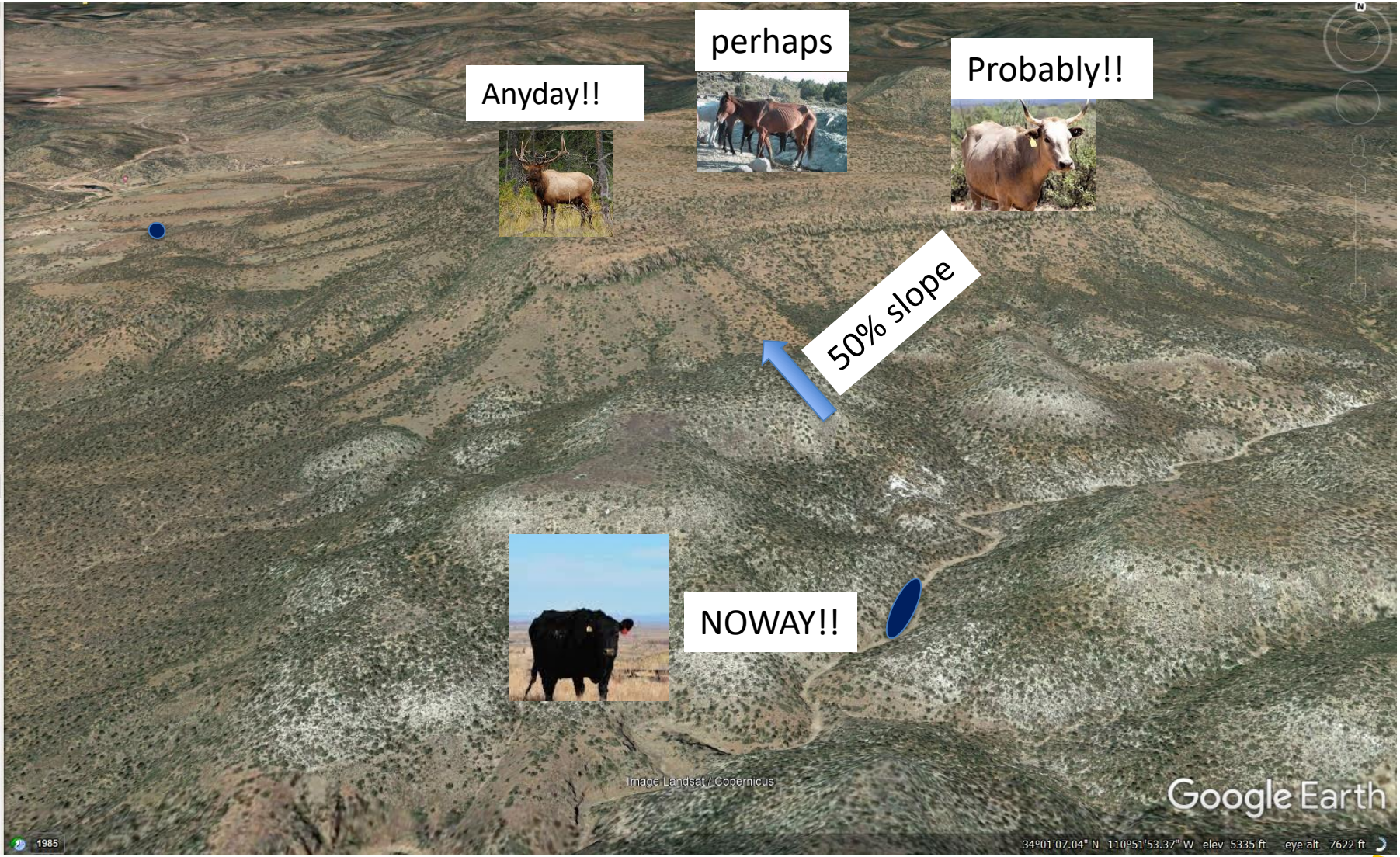
Our Approach: Slope? Water?



Our Approach: Slope? Water?



Our Approach: Slope?



Our Approach: Annual production (Forage)

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What makes it modern?

- At the cutting edge of data and processing:
  - RPMS
  - RAP

  } Long term vegetation trends

  - Consistent and often high-resolution vegetation type data **(e.g. INREV, VCMQ, VMAP, CALVEG)**
  - Water points etc.
  - Cadastral
- Much easier to ask "what if" questions

- Our processing unique
  - Interact the factors (slope, water, veg etc..)

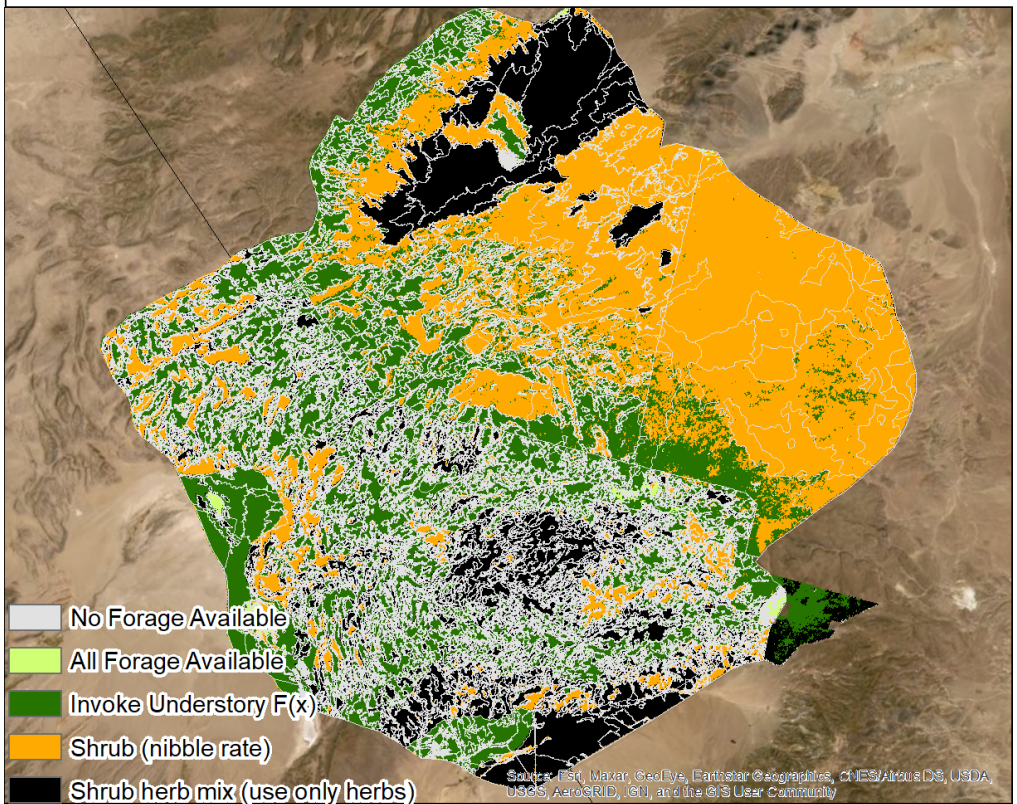
Lets put it all together: Case Study

- Region 5: Wild Horse and Burro AML Assessment

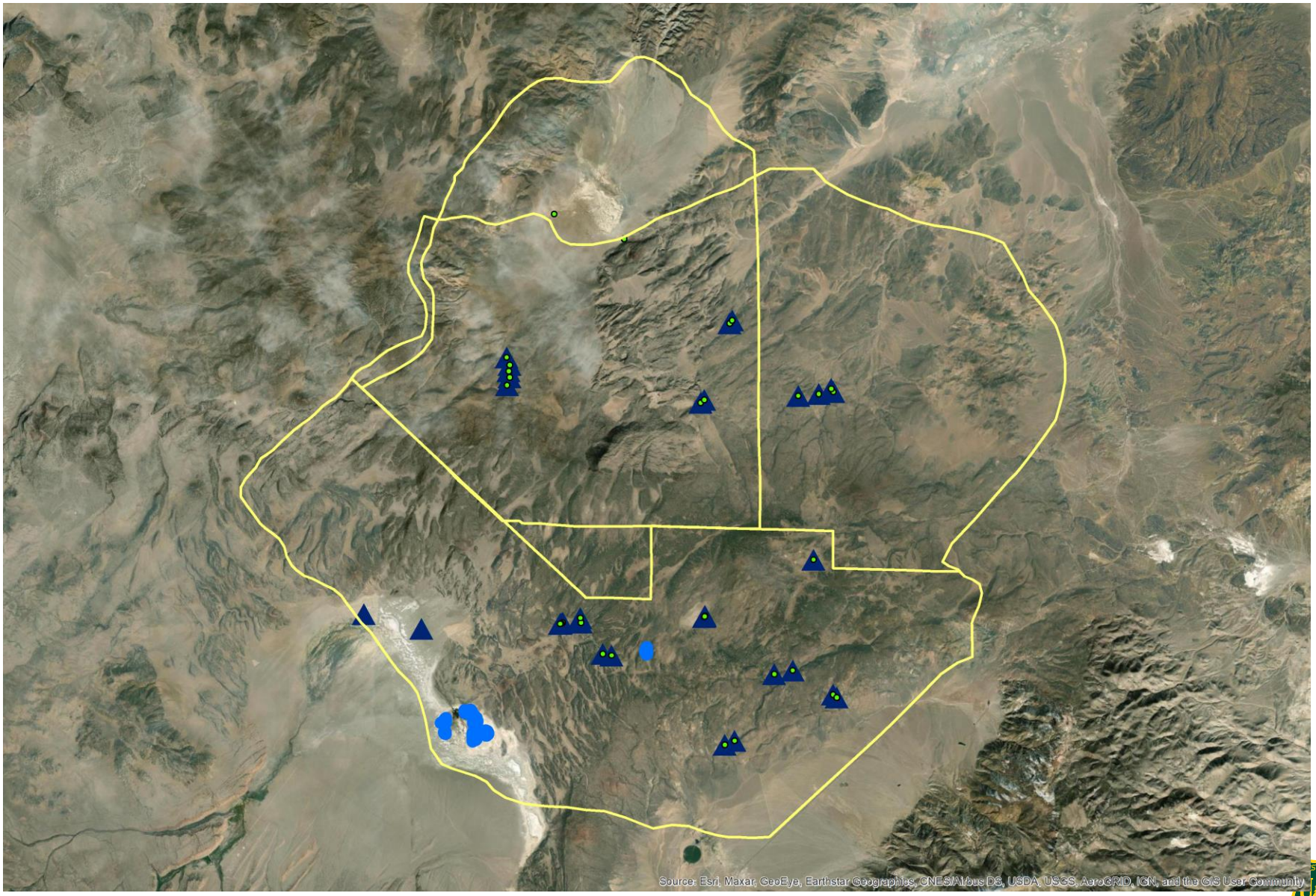
Main Assumptions

- Accept 30% Utilization
- Horses go a maximum of 5 miles from water
- Horses forage on slopes <= 45%
- Horses assumed to require 1.2 AUM forage
  - (780 * 1.2 * 12 = 10,296 pounds of forage per year)
- Horses use <= 2% of shrubs in their diet
  - Preferences change with experience but not with these shrubs (Artr, Chna, etc)
- Must allow for 2977 AUM of forage for cattle grazing:
  - (2977 * 780 pounds per month * 12 months = 2,322,060 pounds)

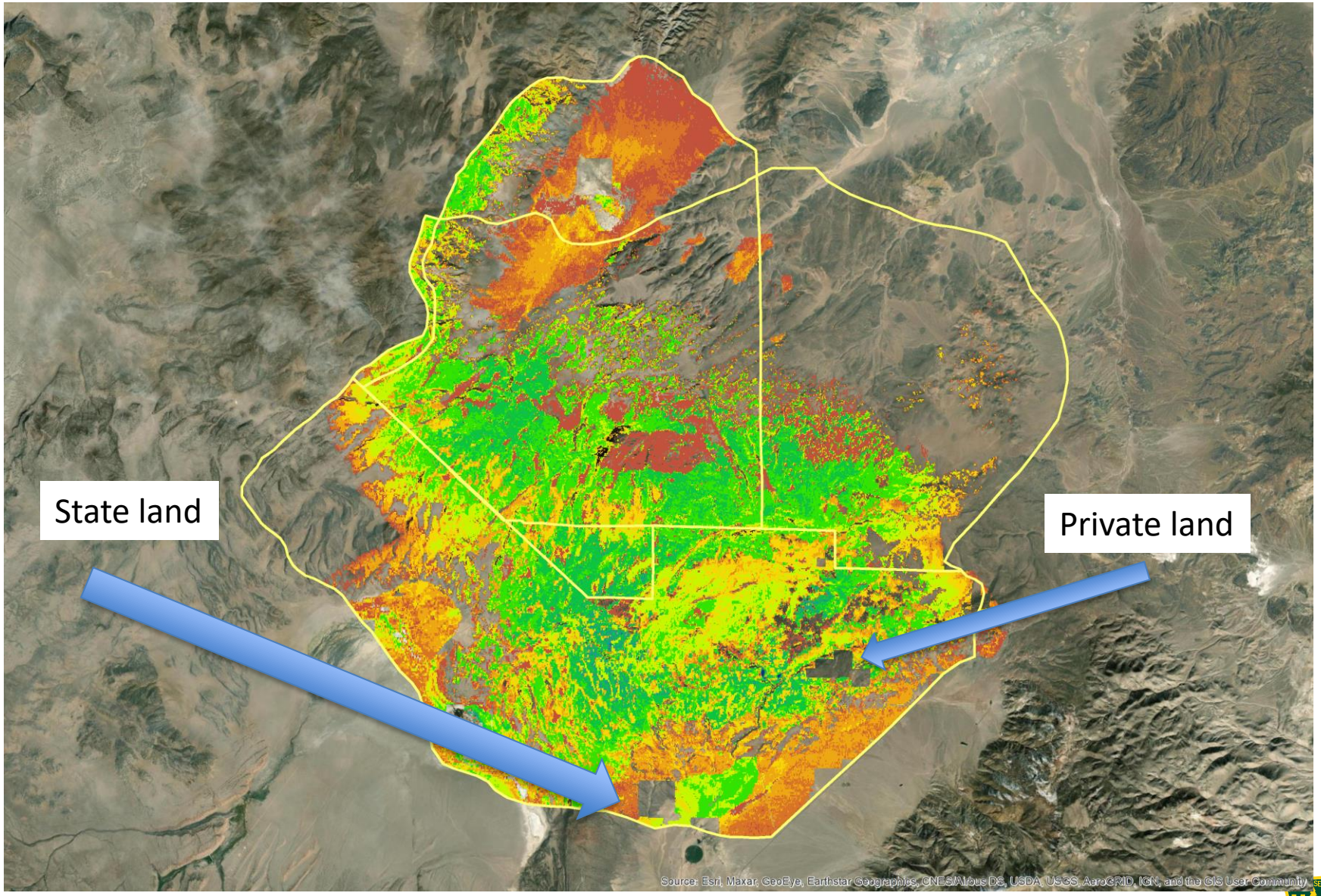
Region 5: WHB AML Assessment



Region 5: WHB AML Assessment



Region 5: Wild horse + Burro Act… Federal Lands Only!!!



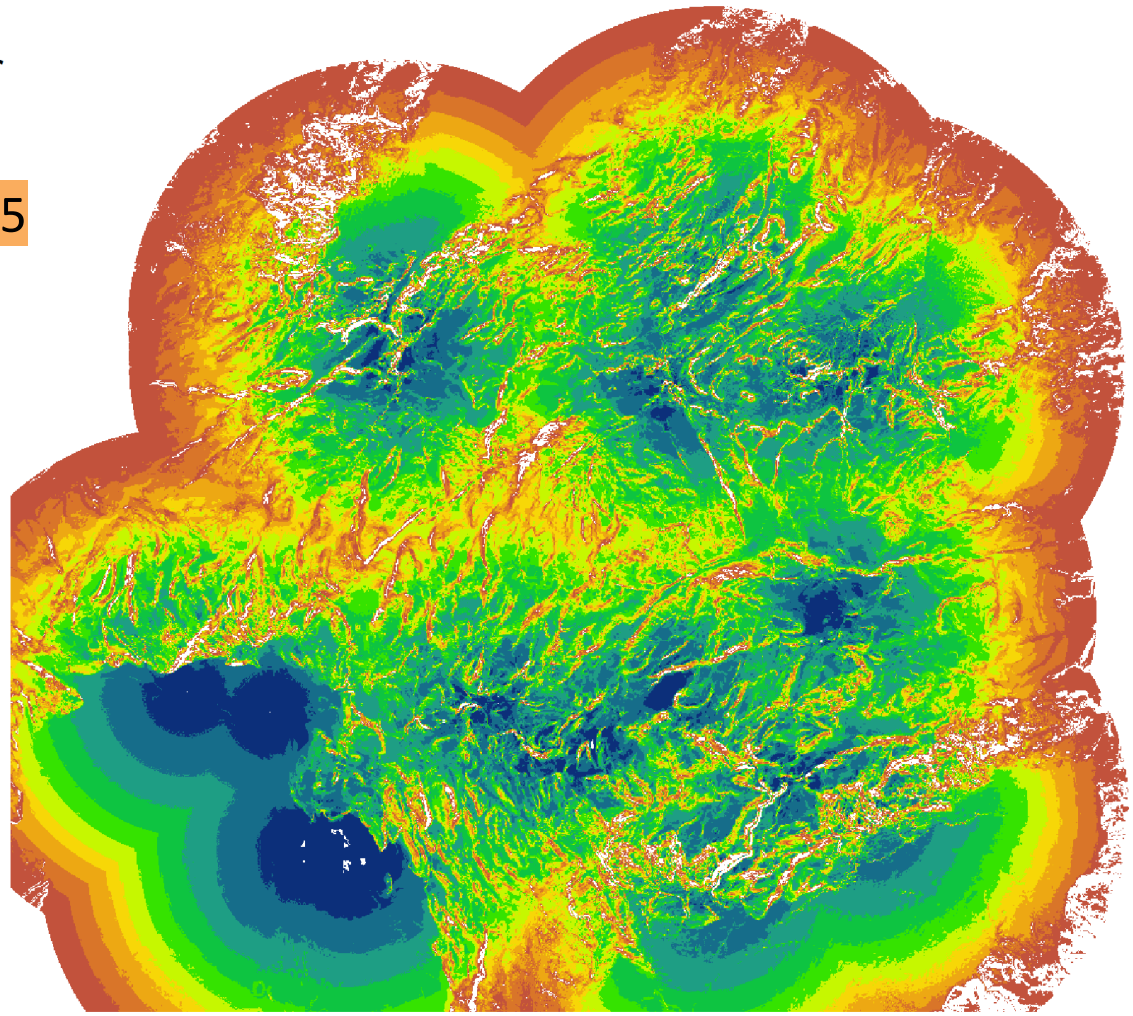
Region 5: WHB AML Assessment

Terrain Correction
Example for Summer Water

Factors interact:
2.5 miles from water = 0.5

22.5% slope = 0.5

Terrain correction = **0.25**



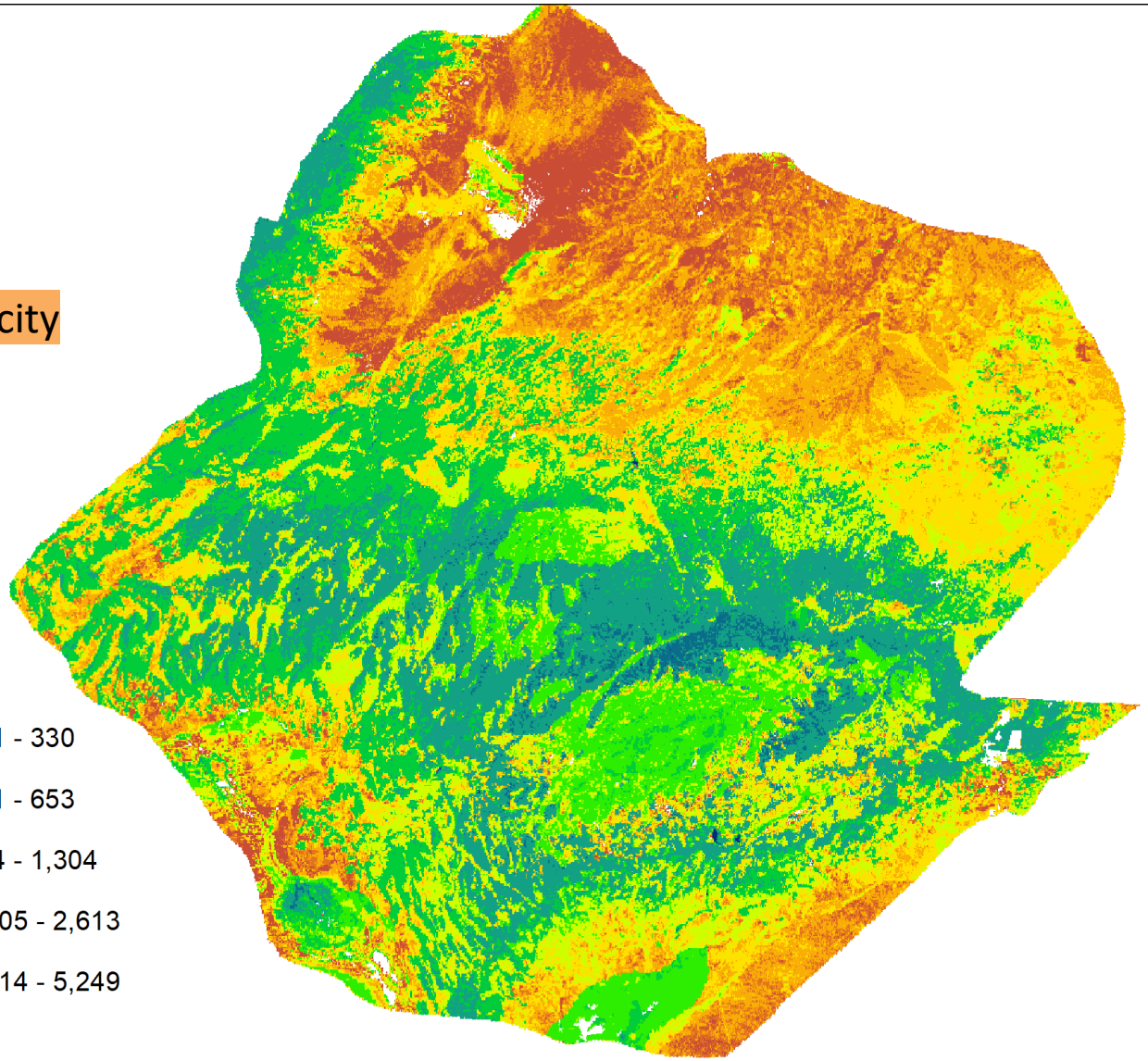
Forage
correction factor

0.01 - 0.11	0.38 - 0.45
0.12 - 0.19	0.46 - 0.55
0.2 - 0.25	0.56 - 0.67
0.26 - 0.31	0.68 - 0.82
0.32 - 0.37	0.83 - 1

Region 5: Without terrain correction?

Non Terrain corrected biomass

~ 1600 horses estimates at capacity

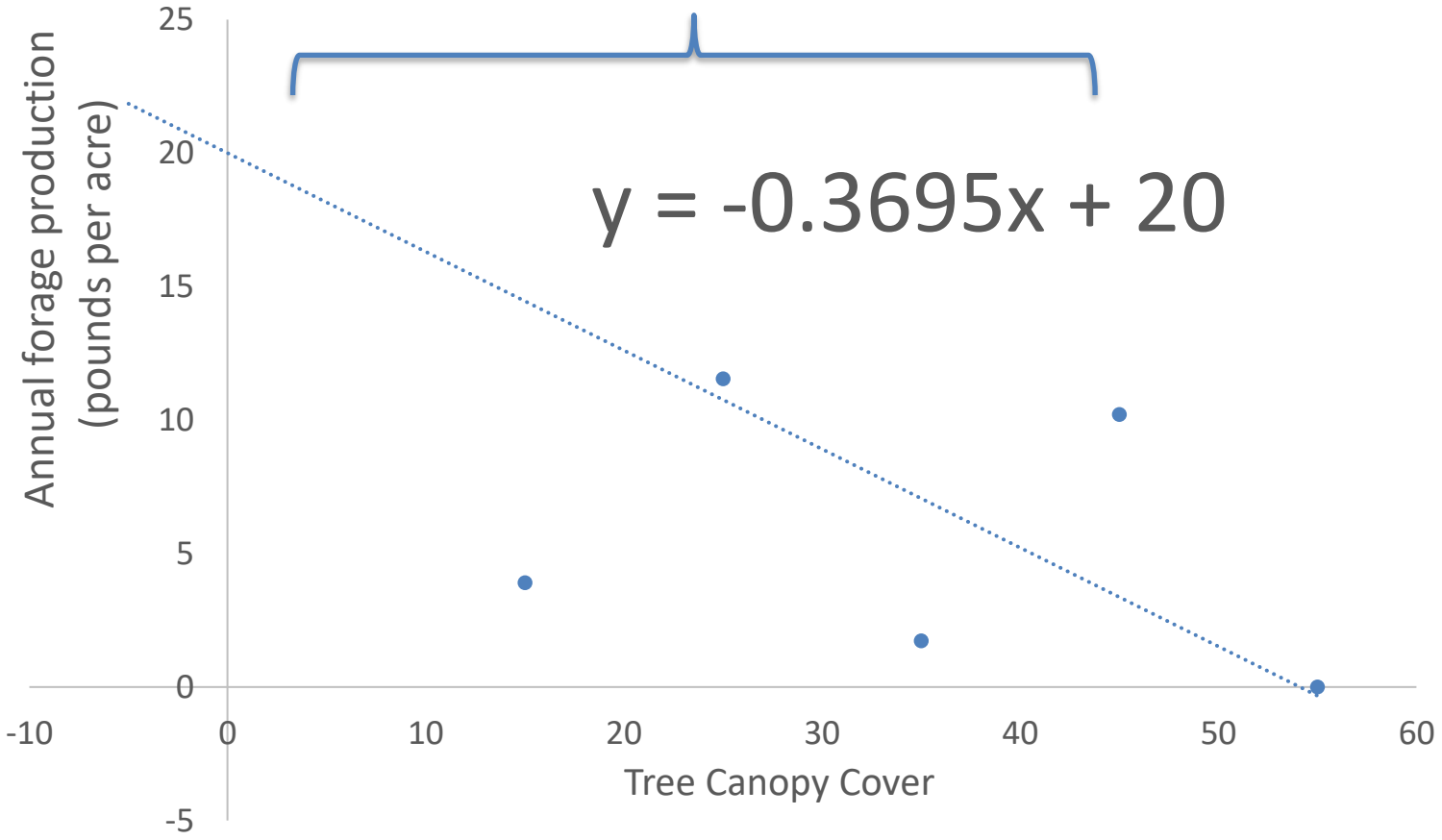


Pounds per acre

1 - 21	171 - 330
22 - 30	331 - 653
31 - 50	654 - 1,304
51 - 90	1,305 - 2,613
91 - 170	2,614 - 5,249

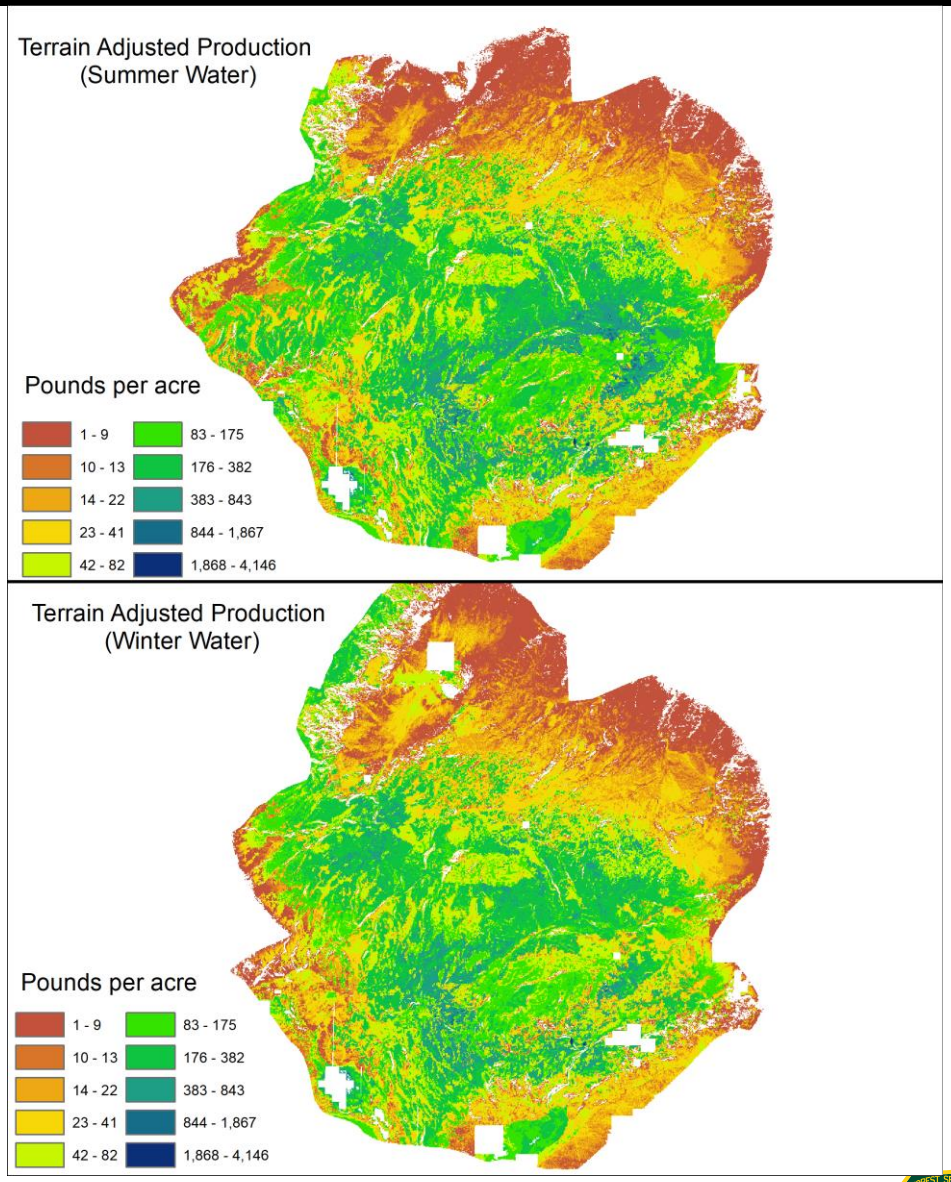
What about forage under trees?

Site	Graminoid	Forb	Subshrub	Shrub	Forage_herb	Forage_herb_Subshrub	VegType	Tree Canopy Cover
MPWHT T49	5.85	1.175	6.25	282	7.025	13.275	PIMO/ARTRW8/PUTR2	Low-Mod
MPWHT T48	3.9	0	0	0	3.9	3.9	PIMO/ARTRW8/PUTR/EPVI	Moderate
MPWHT T46	0	0	0	6	0	0	PIMO/ARTRW8/PUTR2/EPVI	Mod-High
MPWHT T42	0	0	1.25	18	0	1.25	PIMO/ARTRW8	Moderate



Region 5: With terrain correction

Scenario	Winter Water	Summer Water	Average
Above average year	360	416	388
Average Year	246	288	267
Below Average Year	132	160	146

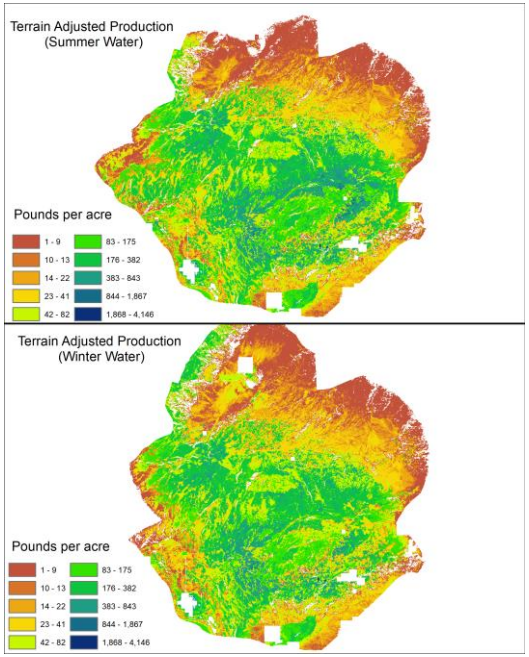


Region 5: How did we get here?

- Total terrain corrected forage (Summer forage) = 12,215,214 lbs, BUT…
- Account for cattle: 12,215,214 lbs - 2,322,060 lbs = 9,893,154 pounds (avg.)

- Horses require: 10296 lbs / year
- So 9,893,154 / 10,296 = 961 horses per year BUT…
- Only expect 30% use so: 961 * 0.3 = 288 horses

- Case of shrubs:
  - 200 lbs per acre * terrain factor 0.5 = 100
  - But horses only eating 2% in model so: 0.02 * 100 = 2 lbs
  - Story about shrubs



This stuff works!!

Region 5: MODERN BECAUSE:…

- Herb, shrub, tree cover from Rangeland Analysis Platform
- Productivity from Rangeland Production Monitoring Service (RPMS) Reeves et al. 2020.
- Cadastral from PADUS
- Plot data from Region 4: Understory function
- VCMQ: R4 high resolution vegetation type
- Calveg: California high res. Vegetation dataset
- Water from the R5 and R4 and BLM
- Approach allows virtually unlimited "what if questions"

All together with assumptions of herbivory and animal behavior!!

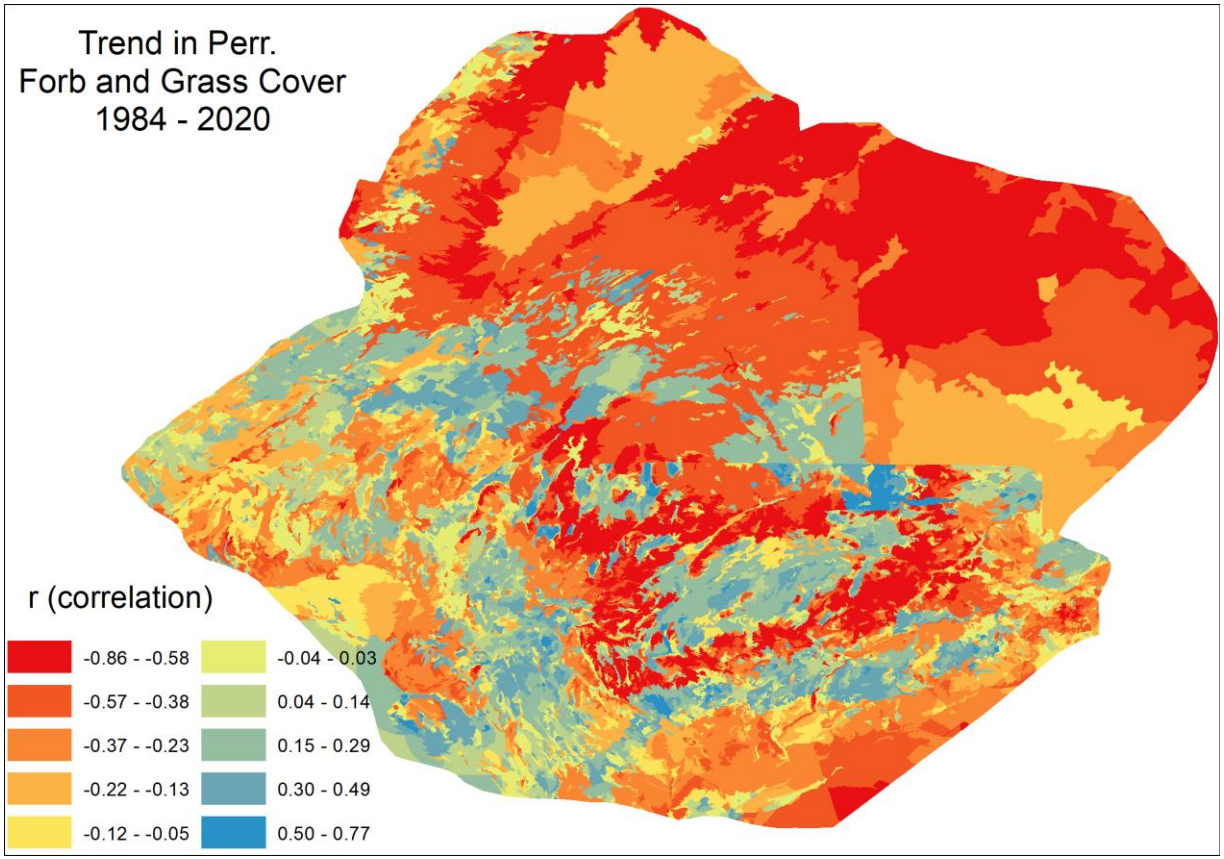
This is our third case study: It works!

Region 5: Conclusion

Scenario	Winter Water	Summer Water	Average
Above average year	360	416	388
Average Year	246	288	267
Below Average Year	132	160	146

Currently: ~ 200 horses

Preliminary Conclusion: **At AML**



Thank You

- To get become a project partner contact me!
  - *NEPA*
  - *Planning*
  - *Allotment management*
- Ramping up in R3 quite a bit

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